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Mushroom Culture

Contrary to a rather common belief, there is nothing mysterious in the cultivation of the mushroom. Any one with a fair understanding of its cultural requirements can grow this highly prized fungus successfully in any climate and in any season where the following conditions fairly obtain:-

ESSENTIAL CONDITIONS

1. Good spawn, procured from a reliable source.
2. A properly prepared bed with reasonable protection against weather extremes.
3. A temperature not greatly exceeding 60° F., nor much lower than 50° F.
4. A fairly moist atmosphere, avoiding the too frequent and direct application of water to the beds.
5. A gradual renewal of the air, avoiding draughts.

MUSHROOM HOUSE

The average cellar, because of its cool and uniform temperature, is an ideal place for the mushroom bed. The ash or coal bin can be utilized for that purpose in the summer; the floor or shelves may be used at all seasons. Caves and abandoned mines present the same advantages and are extensively used. In sheds and specially constructed houses provision must be made for a regulation of the temperature. In greenhouses the waste space under the benches is utilized in the fall, winter, and early spring, and the expended beds, which are very rich in humus and fertilizer, are used for the growing of flowers and vegetables, as a lawn dressing, etc.

TEMPERATURE

The mushroom grows best at a uniform temperature ranging from 53° F. to 60° or 63° F. The temperature of the beds at spawning should be about 75° F., not much higher. At a lower temperature, especially in the winter, the spawn will not get as good a start and the yield may be reduced. When properly started, the spawn will continue to run at the lower temperature of the mushroom house. Cold is less injurious to a running bed than excessive heat. The former renders the bed for a time unproductive, but the latter usually results in the production of small or unsalable mushrooms, or in the eventual death of the spawn, either by "damping off" or by the attacks of the bacterial, insect or parasitic enemies of the mushroom thus developed and stimulated to action.

MOISTURE

Mushrooms, like other fresh vegetables, contain a high percentage of moisture which must therefore be found in or supplied to the beds. They are, however, very sensitive to injury by the direct application of water. When the beds are properly prepared they should contain enough moisture to last until the bearing period. In a dry atmosphere, the normal moisture content of the beds is rapidly lost and the development of the spawn is seriously hindered. A moist atmosphere is therefore required, a percentage of 70 or more relative moisture is desirable.

Where the outside temperature is higher than the temperature of the mushroom house, the beds will not suffer through excessive evaporation. But where these conditions are reversed a dry atmosphere will result. It is then advisable to sprinkle the walls, alleys, the frame of the beds, and, as a last resort, the beds themselves after the casing has been applied.

Small beds may be covered with a layer of about 4 inches of clean straw and an old carpet to prevent evaporation. This covering is removed when the mushrooms commence to appear.

VENTILATION

The growing mushroom assimilates oxygen and throws off carbonic acid gas; it differs in that respect from plants. This distinction plays an important part in cultural methods, and should be carefully noted. The object of ventilation is to remove the carbonic acid gas thrown off by the mushrooms and to replace it by pure air containing the oxygen necessary to their development. A gradual renewal of the air is essential; draughts are injurious and rob the beds of their moisture.

PREPARATION OF THE COMPOST

The cultivated mushroom (*Agaricus campestris*) is best grown in cured or composted horse manure. No practical substitute has been found for this material. The best manure is procured from stables where healthy, grain-fed and hard working horses are kept, and no chemical disinfectants or antiseptics are used. The manure should be fresh and contain a fair proportion of straw, well trampled and saturated with urine; the latter is an essential element in the curing or composting of the material.

The mushroom feeds on cellulose found in the straw of cereals. It cannot, however, assimilate this food in its raw state, nor until it is converted by bacterial action and oxidation into a more digestible form. This transformation is effected by curing or composting the manure, and the agents of transformation are fermentations and chemical reactions aided by the oxygen of the air.

The manure is piled in heaps about 3 feet deep and of various widths and lengths. It is turned two or three times at intervals of about one week so as to expose all portions successively to the action of the air. It is sprinkled lightly at each turning, if too dry, but it should not be drenched, especially at the initial stages. If the manure is of poor quality, containing substitutes for straw such as swamp hay, sawdust or shavings, the composting will require a longer period. In all cases a material rise in temperature is observed, which is a good sign, but it should be watched to avoid burning near the surface, for burned manure is worthless for any purpose. Some growers mix a quantity of loam, about one-fourth, with manure. When the violence of decomposition has subsided and sweet fermentation, as growers term it, has set in, the manure has lost nearly all objectionable odors. Its color has changed to a dark brown, the straws are broken up and it is velvety to the touch. The transformation is then practically complete, and the compost is ready for the beds. The moisture content should be such that, when pressed in the hand, it will retain the shape given it and yet no water will ooze out. Should it be springy and resume its former shape, it is too dry and water should be added.

PREPARING THE BEDS

Two general types of beds are used by mushroom growers. The ridge bed and the flat bed. The former economizes space and gives the best results, but it involves more labor. The latter is more generally used in this country. The cone-shaped ridge has a width of 18 to 22 inches at the base and about an equal height. A pathway of about 15 inches is left between the ridges. Flat beds are made about ten inches deep. There is no advantage in making them deeper. In cellars or mushroom houses flat beds are often built in tiers. The beds when made up should be firmed to some extent to prevent drying out or burning when the secondary fermentation takes place.

SPAWNING

The critical stage of the operations has now arrived, and carelessness at this time may result in complete failure. A reliable thermometer is indispensable at this stage. The temperature of a normal bed freshly made is too high for spawning, or should be too high if the manure has been properly composted. It will usually continue to rise and then gradually fall. The spawn should be planted as soon as the temperature of the bed falls to about 75° F. If, because of overcuring or for any other reason, the initial temperature of the bed is lower than 75° F. and gradually rises to that point, spawning must be delayed until it is ascertained that the temperature will not rise

further. It is equally important that the temperature of the bed be not allowed to drop below 75° F. before spawning. An imperfect run and a poor crop would result. The bed thermometer should be frequently read for a few days before and after spawning, so that a sudden rise may be speedily detected and injury to the spawn prevented. A large proportion of failures is due to an undetected rise in the temperature of the beds after spawning, or to material delays in spawning when the temperature of the beds has fallen to 75° F. It is evident from the foregoing that a supply of spawn should be on hand before the beds are made, or better, before the manure is hauled. A few days delay in the arrival of the spawn, when needed, may result in the loss of the entire crop.

The bricks of spawn are broken into 8 or 10 pieces. An old sawblade may be used for that purpose. The saw is held between the jaws of a vise, and the brick is passed over the teeth at the point where a break is desired. It is then broken uniformly along the cut. The pieces are inserted from 1 to 2 inches below the surface, about 10 inches to 1 foot apart, and the bed is then compressed into final shape. It is advisable to dispose the pieces of brick spawn on the surface of the beds a few days before planting, allowing the mycelium to absorb some moisture and gradually swell. The beds should not require water after spawning, or until they are loamed or cased. Water in quantity applied to the young spawn will almost invariably cause the latter to damp off. The atmosphere of the mushroom house should therefore be kept moist at this time to prevent the drying out of the beds.

CASING OR LOAMING THE BEDS

Ten days or two weeks after spawning the beds should be examined. If the spawn is observed to "run," it is time to case the beds with loam. Casing consists in applying a layer of screened loam, from 1 to 1½ inches deep, to the surface of the bed. Clay or sand should not be used for casing purposes. A calcerous loam or soil is preferable. When applied it should be barely moist. The addition of fertilizers to the loam serves no good purpose. Decaying matter in the loam is injurious and invites disease.

WATERING

Where the compost has been prepared and the beds made with the proper moisture content, and a moist atmosphere has been provided in the mushroom house, no sprinkling will be required before the mushrooms begin to appear. An occasional sprinkling will be necessary, however, during the crop period, preferably after a picking.

PICKING

Mushrooms should appear 5 to 10 weeks after spawning, and the period of production ranges from two to three months. In picking the mushrooms an intelligent hand will carefully twist it from the soil, and fill the hole left in the bed with fresh soil. Pieces of roots or stems should never be allowed to remain on the beds, otherwise decay might set in and infect the surrounding plants. Yields average from one-half to two pounds per square foot, depending on the amount of nutrient developed in composting, the quality of the spawn, the control of essential conditions and the observance of cultural requirements.

THE SELECTION OF SPAWN

Mushrooms are propagated from spawn, and the selection of spawn is as important to the mushroom grower as the selection of seed is to the farmer, the gardener or the fruit grower. The best is the cheapest. Since it is impossible to distinguish a weak strain of mycelium in a brick of spawn from a prolific strain, the spawn should be procured from a reliable source. Until recently spawn could only be produced by division of the tissue or mycelium, a form of dilution tending to a gradual weakening of the strain and reduction in the yield. The discovery by a French scientist of nature's method of germinating the spores (or seed) of the mushroom has entirely overcome this serious objection, and permits the manufacture of spawn by direct

spore culture. The French spore process is exclusively owned and controlled in this country by the American Spawn Company of St. Paul, Minn., the oldest and largest manufacturers of mushroom spawn in the United States and Canada, and pioneers in the progressive development of pure culture spawn. Their latest product, known as "American Spore Culture Spawn" is inoculated with pure spore cultures of selected varieties, and is therefore true to type, free from foreign molds and parasitic diseases, and of maximum strength and prolificness.

Owing to the extreme importance of spawning the beds when the optimum temperature has been reached, and the possibility of delays in transportation, or of a temporary shortage in the market supply, growers should place their orders with their dealers well in advance of their needs.

Brick spawn of close grain and reliable manufacture may be kept for a considerable period without material deterioration, when stored in a cool and dry place. When properly stored it will retain its vitality for at least one year.

Directions for Planting

BOTTLE SPAWN

After breaking the bottle, contents should be divided into pieces about the size of a walnut and planted one-half inch below the surface of the bed, leaving a space of about one foot between each inoculation. The bed temperature should under no circumstances exceed 75 degrees. One quart bottle should plant an area of between 35 to 40 square feet. Bottle Spawn, on account of its perishable nature, should be used as soon as possible and kept away from flies and other insects.

